

ES | EXECUTIVE SUMMARY

PURPOSE OF THE WATER SYSTEM PLAN

The City of Kent's (City) water system is a major infrastructure, much of which is invisible to the customers that receive its water. The water system requires qualified staff to operate and maintain an ongoing capital improvement program to replace old components to meet the requirements mandated by federal and state laws. The primary purpose of the City of Kent Water System Plan (WSP) is to identify and schedule water system improvements that correct existing system deficiencies and ensure a safe and reliable supply of water to current and future customers. This WSP complies with Washington State Department of Health (DOH) regulations under Chapter 246-290 Washington Administrative Code (WAC), which requires water purveyors to update their water system plans every 10 years. This WSP has been written to meet 10-year planning requirements.

The City's previous WSP was prepared in 2011. This updated 2019 WSP reflects King County's (County) population allocation to the City and the City's current Urban Growth Area (UGA), which are consistent with the City's 2015 *Comprehensive Plan* and the County's 2018 *Comprehensive Plan* updates. The WSP also reflects improvements and changes to the water system since the completion of the 2011 WSP.

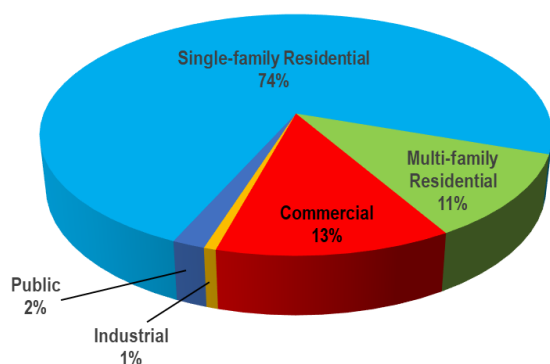
SUMMARY OF KEY ELEMENTS

This WSP presents a description of the existing water system and service area, a forecast of future water demands, policies and design criteria for water system operation and improvements, the operations and maintenance program, staffing requirements, a schedule of improvements, and a financial plan to accomplish the improvements. The WSP also includes several ancillary elements that include a water use efficiency program, a water quality monitoring plan, a wellhead protection program, and a cross-connection control program. A summary of the key issues related to these elements is provided in the following sections.

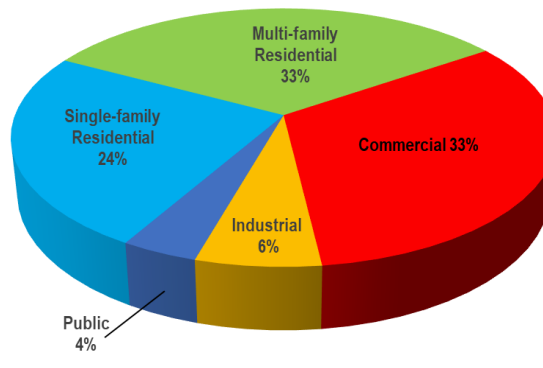
WATER SERVICE AREA

In 2016, the City provided water service to approximately 68,157 people throughout its water service area boundary, which extends beyond the City's corporate limits to include small areas of Auburn, Tukwila, and unincorporated King County. The City is responsible for providing public water service, utility management, and water system development within this area. The City will provide new water service within the City limits and designated retail water service area (i.e., where there are existing water mains). Requests for new water service outside of the City limits but within the UGA, where there are no existing water mains fronting the property, will only be granted upon extension of water service and completion of an annexation agreement.

In 2016, the City provided water service to an average of 14,907 connections, which were mainly comprised of single-family connections. Single-family connections represent approximately 74 percent of all accounts, but the single-family class only consumed 24 percent of all water supplied to the system in 2016.



2016 Water Connections



2016 Water Consumption

EXISTING WATER SYSTEM

The City's water system initially dates to the latter part of the nineteenth century, when a spring was tapped on the East Hill to provide water to the Kent Water and Light Company. The City purchased the water system in 1892. In 1926, the City purchased the Kent Springs water source, and began developing the Clark Springs source in the 1930s. In the 2000s, the City partnered in the Tacoma Regional Water Supply System, which became the City's third primary water source. The City has ten additional well sources; however, these wells are typically only used periodically to ensure they are regularly exercised due to the higher operation costs. A summary of the City's supply sources is shown in [Table ES-1](#).

Table ES-1
Supply Facilities Summary

Facility	Type	Supplies Water To	Year Installed	Use	Existing Capacity (gpm)	Water Treatment	Generator
208th Street/ 212th Street Wellfield	4 wells	240 Zone	1982, 2001	Active	3,500	Chlorination, Fluoridation, Manganese/Iron/Hydrogen Sulfide Removal, pH Adjustment	208th: None 212th: Hookup for portable generator
Armstrong Springs Wells	2 wells	CSTM/ KSTM	1982	Active	1,050	Chlorination, Fluoridation, pH Adjustment	On-site
Clark Springs	Infiltration gallery and collector, 3 wells	CSTM	1957, 1969	Active	5,400	Chlorination, Fluoridation, pH Adjustment	On-site generator partially powers facility
East Hill Well	1 well	590 Zone	1979	Active	1,900	Chlorination, Fluoridation, pH Adjustment	On-site
Garrison Creek Well	1 well	240 Zone	1981	Active	500	Chlorination, Fluoridation	On-site generator for SCADA system only
Kent Springs	Infiltration gallery, 3 wells	KSTM	1908, 1977, 2001	Active	3,680	Chlorination, Fluoridation, pH Adjustment	On-site generator
O'Brien Well	1 well	240 Zone	1951	Active	243	Chlorination, Fluoridation	None on-site, towed generator is used
Seven Oaks Well	1 well	CSTM/ KSTM	1982	Active	350	Chlorination, Fluoridation, pH Adjustment	None
Tacoma RWWS	Intertie	KSTM/ 590 Zone	2005	Active	8,778	Chlorination, Fluoridation, Filtration, Ozone Treatment, pH Adjustment ¹	Site has full backup power

¹ = pH adjustment occurs in Tacoma system and when RWSS water is directed through the KSTM to the Guiberson Reservoir.

The City's water system has nine storage facilities that provide storage directly to various zones in the system. Details of the City's storage facilities are shown in [Table ES-2](#).

Table ES-2
Storage Facilities Summary

Reservoir	Approximate Location	Pressure Zone	Year Constructed	Construction Type	Capacity (MG)	Diameter (feet)	Base Elev. (feet)	Overflow Elev. (feet)
6 Million Gallon #2 Reservoir	Garrison Creek Park	240 Zone	1969	Reinforced concrete below grade	6	Variable	212	240
Guiberson Reservoir	E Guiberson St and Kensington Ave S	240 Zone	Late 1930s	Reinforced concrete below grade	3	Variable	222	240
Reith Road Standpipe	Reith Rd S, just north of W Fenwick Park	354.5 Zone	1959	Steel	1.0	66	315.0	354.5
6 Million Gallon #1 Reservoir	98th Ave S and S 239th PI	416 Zone	1967	Steel	6.0	146	370.0	418.0
125K Tank	98th Ave S and S 239th PI	485 Zone	1958	Elevated steel	0.125	32	462.0 ¹	485.0
Cambridge Tank	S 264th St and Military Rd S	529 Zone	1959	Elevated steel	0.3	53.33	499.1 ²	529.0
3.5 MG Tank	124th Ave SE and SE 286th PI	590 Zone	1978	Steel	3.5	74	483.4	592.9
640 Tank	SE 248th St and 124th Ave SE	590 Zone (Future: 640 Zone)	2011	Steel	4.0	75	523.0	595.0 (Future: 645.0)
Blue Boy Standpipe	112th Ave SE and SE 246th PI	590 Zone	1965	Steel	0.97	42	499.7	593.8

1 = Ground elevation 386.8 feet.

2 = Ground elevation 441 feet.

The City's water system has six booster pump station facilities that provide supply to the 354.5 Zone, 485 Zone, 529 Zone, 575 Zone, 587 Zone, and 590 Zone. A summary of the City's pumping facilities is shown in [Table ES-3](#).

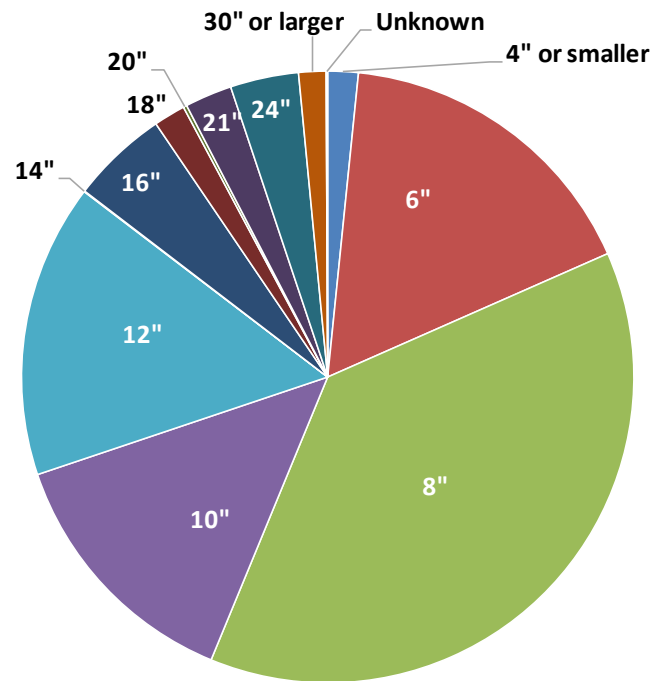
Table ES-3
Booster Pump Station Facilities Summary

Pump Station	Suction Pressure Zone	Discharge Pressure Zone	Year Constructed	Existing Pumping Capacity (gpm)	Number of Pumps	Pump Type	Pump Motor Size (HP)	Generator
Pump Station #3	240 Zone	354.5 Zone	1959	1,800	2	Horizontal split case	(2) 50	On-site
Pump Station #4	354.5 Zone	529 Zone	1959	3,800	3	Horizontal split case	(2) 75 (1) 150	On-site
Pump Station #5	416 Zone	485 and 590 Zones	1975	6,350	4	Horizontal split case	(2) 125, (1) 40, (1) 40/125	On-site
Pump Station #6	529 Zone	587 Zone	1984	1,200	3	Vertical turbine	(3) 20	Has hookup for portable generator
Pump Station #7	529 Zone	575 Zone	1985	500	2	Horizontal	(2) 10	On-site
Pump Station #8	Highline Water District 560 Zone	587 Zone	1986	1,200	3	Vertical turbine	(3) 20	Has hookup for portable generator

The City's water system contains 284 miles of water main ranging in size from 1 inch to 36 inches in diameter. As shown in [Table ES-4](#), most of the water main (approximately 85 percent) within the system is 12 inches in diameter or less. The remaining 15 percent of the water main is 14 inches in diameter or larger.

Table ES-4
Water Main Diameter Inventory

Diameter (Inches)	Length (Feet)	% of Total
4 or smaller	24,139	1.6%
6	251,772	16.8%
8	567,492	37.8%
10	204,265	13.6%
12	232,958	15.5%
14	579	0.0%
16	76,769	5.1%
18	25,118	1.7%
20	2,817	0.2%
21	37,316	2.5%
24	54,154	3.6%
30 or larger	21,626	1.4%
Unknown	1,203	0.1%
Total	1,500,208	100%



PAST WATER USAGE

In general, the amount of water consumed by the City's customers has increased approximately 13 percent since the year 2011. This is most likely the result of the 700 new service connections added to the system and the increased usage of water per connection of both commercial and multi-family residential customer classes. During this time, the average water use of single-family residential customers has remained relatively steady, at an average of 157 gallons per day per connection. [Table ES-5](#) lists the total amount of water supplied to the system from 2011 through 2016.

Table ES-5
Historical Water Supply

Year	Annual Supply (gallons)
2011	2,498,178,000
2012	2,566,823,000
2013	2,593,245,000
2014	2,659,170,000
2015	2,811,692,000
2016	2,818,790,000

FUTURE WATER DEMANDS AND WATER SUPPLY

Overall water demand within the City's system is expected to increase by approximately 14 percent of 2016 demand by the end of the 20-year planning period, without savings from the City's Water Use Efficiency program. The projected water demand and supply capacity data is shown graphically in [Chart ES-1](#).

The existing and projected ERU data is shown graphically in [Chart ES-2](#).

Chart ES-1
Future Water Demand and Supply Capacity

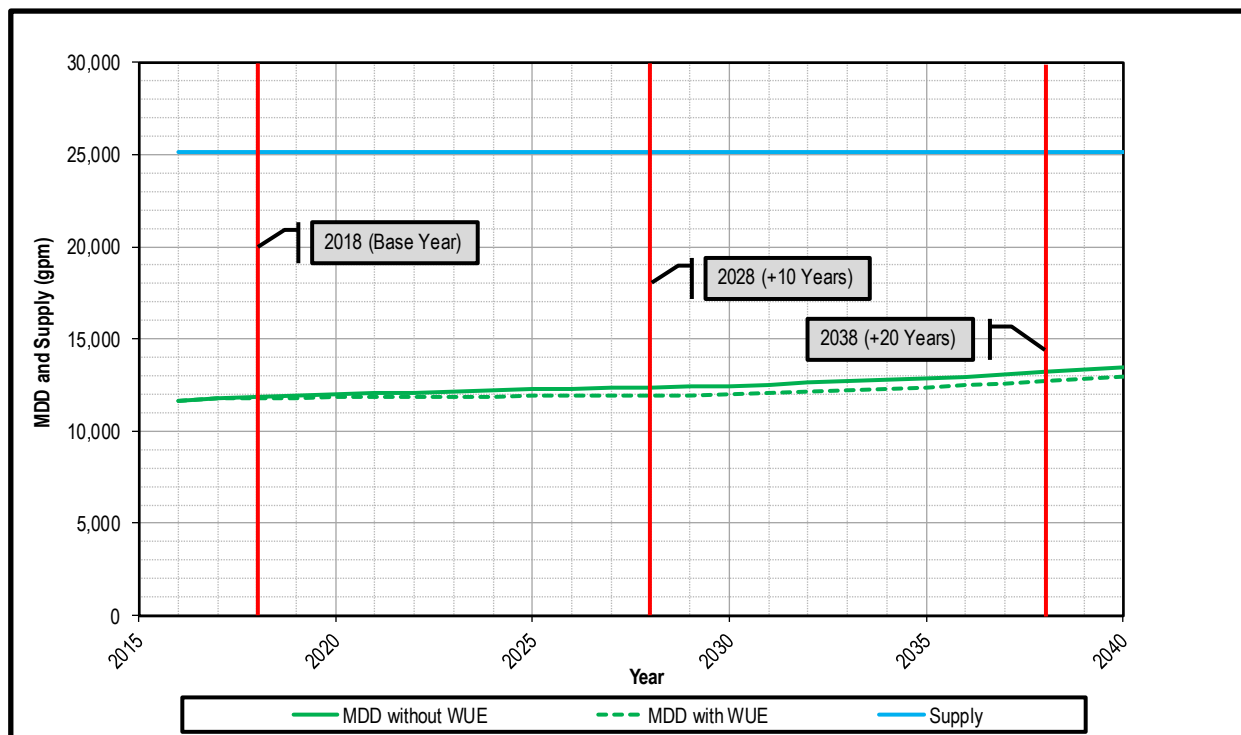
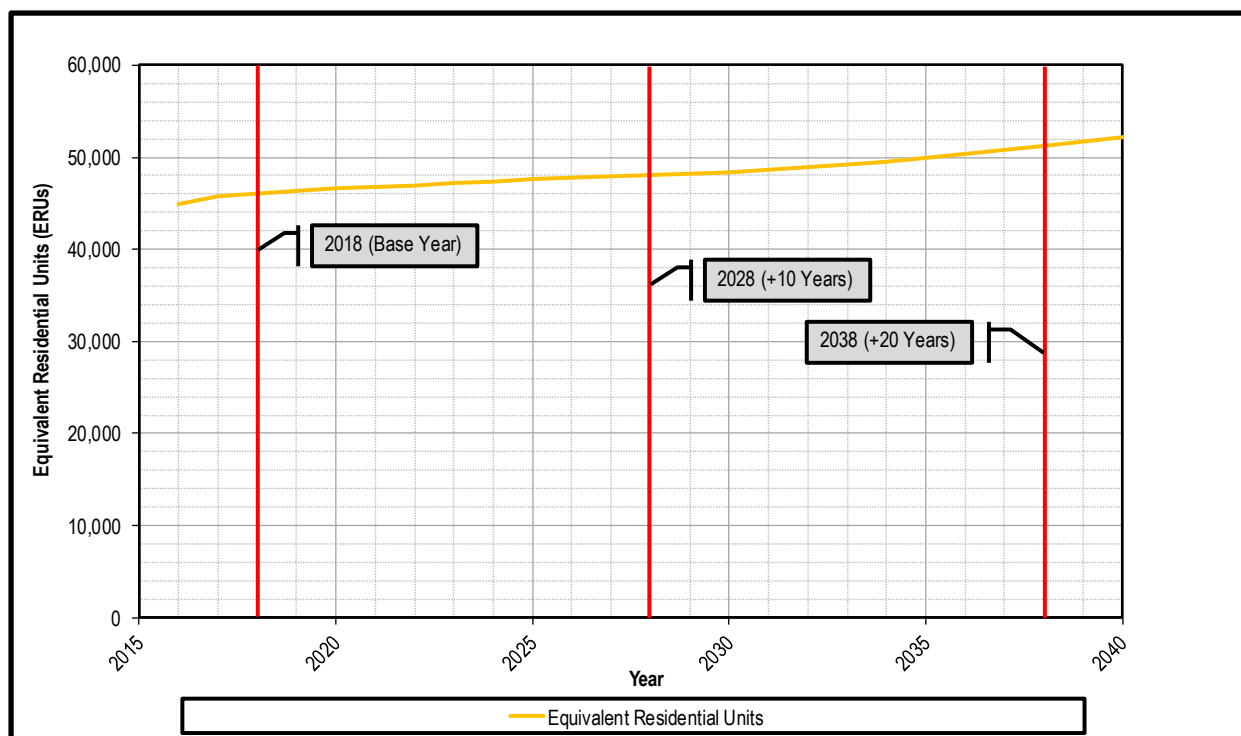


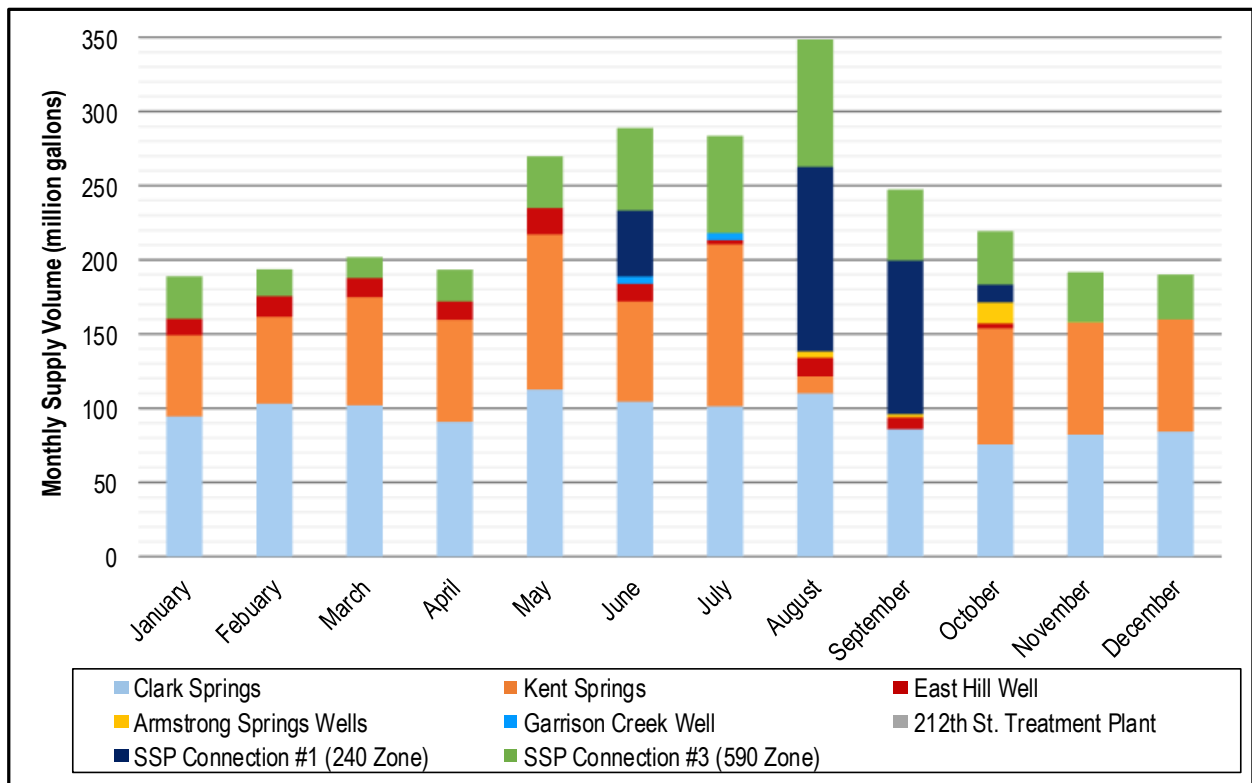
Chart ES-2
Future ERUs



WATER SOURCE AND QUALITY

Water supply in the City's system is supplied predominantly from Kent Springs, Clark Springs, and the Tacoma Regional Water Supply System as shown in [Chart ES-3](#). Water also can be supplied by ten other groundwater wells. The 208th Street/212th Street Wellfield consists of four wells, two wells are located at the Armstrong Springs site, and one well is located at each of the East Hill Well, Garrison Creek Well, O'Brien Well and Seven Oaks Well sites. As shown in [Chart ES-1](#), the City's water sources have sufficient capacity to meet the existing and projected needs of the water system through the 20-year planning period.

Chart ES-3
2016 Monthly Water Supply by Source



Water from all the City's sources are chlorinated and fluoridated. In addition, aeration and sodium hydroxide pH adjustment are used at the Guiberson Reservoir site to treat blended Kent Springs and Tacoma water. The City also uses pH adjustment at the 212th Street Treatment Plant, Pump Station #5, and the East Hill Well.

OPERATIONS AND MAINTENANCE

The City's operations and maintenance organization is staffed by well qualified, technically trained personnel. City staff regularly participate in safety and technical seminars to keep abreast of the latest changes in the water industry and ensure a smooth and safe operation of the water system. The current staff of supervisory personnel and field crew, in which many are responsible for the water system and other utilities, have effectively operated and maintained the water

system in the past. As the water system expands in the future and continues to age, additional staff will also be required. The City plans to add staff to meet the increased requirements from system expansion as the budget allows.

The City has taken several steps to prepare for emergency situations. A vulnerability assessment and City-Wide Emergency Response Plans have been prepared that conform to the requirements of the Bioterrorism Act of 2002. The documents contain a vulnerability assessment of the City's water system facilities, a contingency operation plan for responding to emergency events, a list of water personnel responsible for making decisions in emergency situations, and other elements.

Additionally, a seismic vulnerability assessment was completed in 2017 that identifies the City's risk to seismic hazards and recommends mitigation to reduce the risk of failure due to those hazards. Results of the assessment were considered in the development of the water system capital improvement program. The Water Department also participated in a SCADA system vulnerability assessment with the City's IT Department and the Department of Homeland Security in 2017 and 2018. The recommendations from the assessment are being implemented by the City.

WATER SYSTEM EVALUATION

The existing water system was evaluated to determine its ability to meet the policies and design criteria of the City and those mandated by DOH. The results of the evaluation are summarized below.

- The City has sufficient water source capacity to meet the demands of existing and future customers until at least 2038.
- The O'Brien Well is not normally operated because sand is present inside the well screen and high levels of manganese are present in the groundwater. Improvements to provide 480-volt power to the site, redevelop the well, and provide treatment are included in [Chapter 9](#).
- The City has sufficient water storage capacity to meet the demands of the existing and future customers until at least 2038.
- A new 587 Zone reservoir will be constructed by 2028 to provide redundancy in the West Hill operating area. The reservoir will be accompanied by a new BPS that will provide an additional 1,000 gpm of firm capacity to the West Hill operating area. The existing pump stations on the West Hill will be equipped with new PRVs to facilitate these operational changes in the service area.
- The Guiberson Reservoir was constructed in the 1930s, is nearing the end of its useful life and is in need of replacement.
- The easterly portion of the City's existing 590 Zone will be converted to a 640 Zone to resolve storage deficiencies in the 590 Zone and moderately low pressures in the conversion area.
- The 575 Zone will be converted to the 587 Zone to improve the level of service to the 575 Zone.
- Several areas of the system require water main replacements to resolve deficiencies related to high water velocities, aging water main, and undesirable materials.

PROPOSED WATER SYSTEM IMPROVEMENTS AND FINANCING PLAN

Improvements to the water system are necessary, primarily to resolve existing system deficiencies, but also to accommodate the increase in water demands from future growth. Improvements identified for the first 5 years of the capital improvement program (2019 through 2023) are estimated to cost approximately \$36,346,000, which results in an average expenditure of approximately \$7,269,200 per year. Improvements in the following 5 years (2024 through 2028) are estimated to cost approximately \$30,000,000, or approximately \$6,000,000 per year. The financial analysis is intended to illustrate the feasibility of funding the capital and non-capital improvements for the water system in the next 10 years. It is anticipated that projects identified in this WSP will be financed from cash on hand.

The combination of the historical financial data presented in [Chapter 10](#), in conjunction with the financial plan for future revenues and expenditures, demonstrate the financial viability of the City's Water Utility.

The funding for capital improvements in this WSP is balanced. However, the City recognizes that the economy and other factors can change the needs of the water system. In 2016, the city completed a water rate study and adopted a new rate structure for the water utility that addressed the operating and capital needs for the system. The current rate structure adopted a fund balance reserve policy that requires 20 percent of operating expenses balance that would be available for emergency situations. The City anticipates beginning another rate study in 2020 to be completed in 2022.

As the existing infrastructure continues to age, managing and funding the water system CIP is essential to maintaining a safe and reliable water supply for the City's customers. Based on the existing level of repair and replacement identified by the City for the water system CIP, the amount of water main in the system that is greater than 65 years old will increase from 2 percent to 19 percent by the end of the 20-year planning period, as shown in [Chart ES-4](#). As funding becomes available, the City should consider a more aggressive water main repair and replacement program or continue to develop asset management strategies to address future infrastructure needs.

Chart ES-4
Existing and Future Water Main Age

